

CLAIMS

1. A substation for use in a power transmission and distribution network, characterised by:
  - .. 5 a single phase isolating high frequency transformer having at least one input winding and at least one output winding;
  - an input solid state high frequency switching network comprising a plurality of semiconductor switching devices, the input switching network defining at least one input node for receiving an input power waveform from the transmission network and at least one output node connected to the primary winding of the transformer;
  - 10 at least one output solid state high frequency switching network comprising a plurality of semiconductor switching devices, the output switching network being connected to the secondary winding of the transformer and defining at least one output node from which an output power waveform can be taken from the substation; and
  - 15 control means adapted to control the operation of the switching devices of the input and output switching networks to generate the output waveform at the output node from the input waveform applied to the input node.
- 20 2. A substation according to claim 1 in which the control means is adapted to control the semiconductor switching devices in dependence upon current and/or voltage applied to the input switching network.
- 25 3. A substation according to claim 1 or claim 2, in which the control means is connected to receive power condition signals from measurement means located to sense power flowing to the input node(s), the control means being adapted to output signals to the input and output solid state switching networks thereby to control switching of the semiconductor switching devices therein in response to variations in the power condition signals.
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4. A substation according to any preceding claim in which the input switching network comprises a bridge circuit having at least one input node for each phase of the input supply.

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5. A substation according to any preceding claim in which the control means is adapted to:

control the semiconductor switching devices in the input switching network so that a single substantially sinusoidal waveform is generated in the  
10 primary side of the transformer; and

control the semiconductor switching devices in the output switching network to reconstruct one or more output waveforms of different phase from the waveform in the secondary side of the transformer.

15 6. A substation according to any preceding claim in which the control means is adapted to control the semiconductor switching devices so as to produce at least one output voltage waveform which is independent of the input voltage waveform.

20 7. A substation according to any preceding claim in which the semiconductor switching devices are arranged in relation to the transformer so that in the event of a failure of one or more semiconductor switching devices or of the transformer or of the control means then power is not transmitted across the transformer.

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8. A substation according to any preceding claim in which the control means is adapted to control the semiconductor switching devices, at least of the input switching network, in such a way as to match the input impedance of the substation to the source impedance of the supply line.

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9. A substation according to claim 8 in which the control means is adapted to modify the switching state of one or more of the switching devices thereby to control the source impedance in real time.

5 10. A substation according to any preceding claim in which a limiting means is provided which is adapted to reduce the maximum output voltage produced in the event that the current drain exceeds a preset level.

10 11. A transmission and distribution network comprising a transmission line for the transmission of electrical power from a generator, a substation in accordance with any one of claims 1 to 10 operatively connected to the transmission line, and one or more distribution lines connected to the output of the substation for onward supply of power to a load.

15 12. A network according to claim 11 in which the load comprises a second transmission line adapted to transmit alternating voltage from a generator, and the control means is adapted to control the switching of the switching devices to generate an output waveform for supply to the second network which is in phase with the phase of the voltage on the second network.

20 13. The network of claim 11 or claim 12 in which the substation comprises two transformers and associated input and output switching networks connected in parallel between the supply line and the output load.

25 14. The network of claim 14, 15 or 16 in which a circuit breaker and an isolator are provided upstream of the substation and an isolator is provided downstream of the substation.